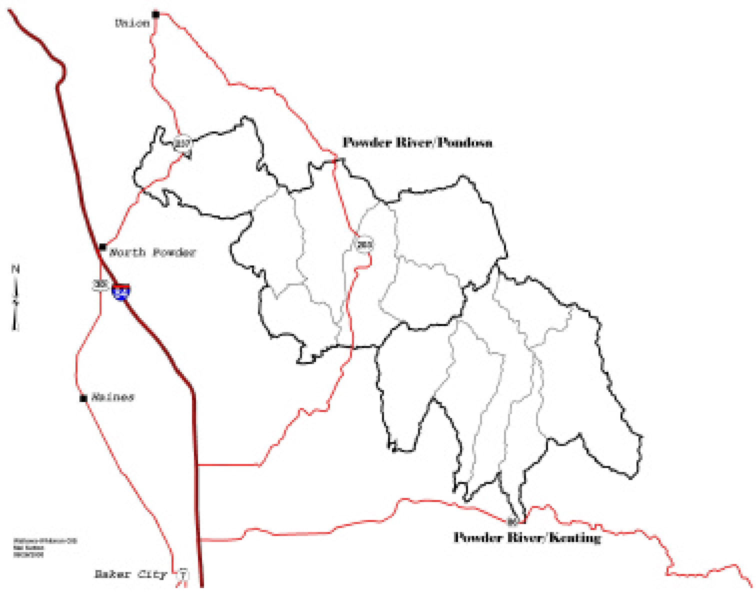
CHAPTER 1 CHARACTERIZATION OF THE WATERSHED AND CURRENT CONDITIONS

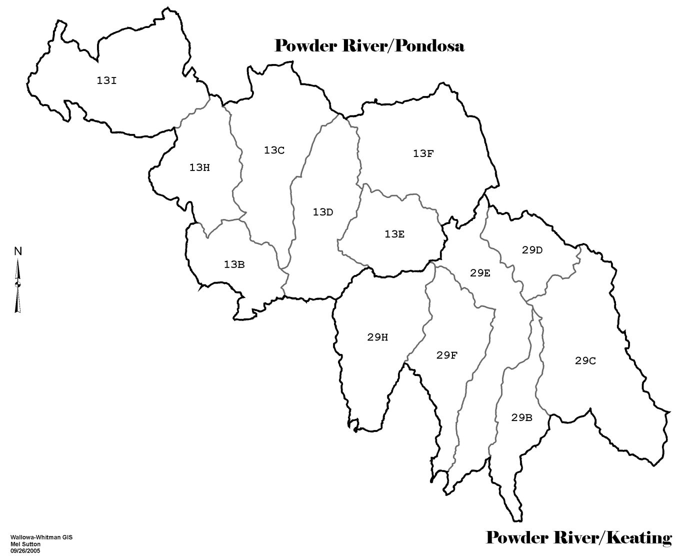
1.1 INTRODUCTION

1.1.1 Geographic Setting

The Powder/Pondosa 13 and Powder/Keating Watershed 29 (herein referred to as the watershed) is that portion of the Keating Valley and the drainage system of Big Creek and the Powder River that flow into the Powder River at mile ___. The watershed is dissected by state Highway 203 and starts at the Catherine Creek summit, stretching mostly south and east from there (see Map 1.1). The unincorporated cities of Medical Springs, Keating and Pondosa are located within the watershed.



The watershed is further divided into 13 subwatersheds (see map 1.2)



1.1.2 Geology

The watershed lies within a complicated mix of Paleozoic and Triassic igneous, sedimentary, and a mélange of metamorphic rocks that form a portion of the earth.s crust known as the Baker Terrane (Bishop 1984). Evidence suggests that the Baker Terrane started as a fore arc and subduction zone that underwent rapid subduction, high shear stress, and internal mixing (Vallier 1992). Of specific interest to many researchers is the Canyon Mountain Complex, an ophiolite complex formed as an island arc that makes up part of the Aldrich-Strawberry Mountains. The Canyon Mountain ophiolites are a 200 to 250 million-year-old fragment of oceanic crust, a small sample of the upper mantle consisting of gabbro and peridotite that rose to the earth.s surface as magma. As this era ended, the solidified rocks emerged from the sea and were subject to intense erosion. About 180 million years ago, the Canyon Mountain Complex was submerged under a shallow sea into which volcanic material flowed; the igneous rocks were then buried under mudstone and shale (Thayer 1990). Periods of volcanism, mountain building, and erosion over the last 60 million years have left andesite and mudflow breccia. Between 10 and 2 million years ago, compressive forces lifted the earth.s crust over 1.5 miles and created the Aldrich-Strawberry Mountain Range. Since that time, ice, wind, and water have combined to erode and shape the mountains and valleys present today.

1.1.3 Topography

The watershed encompasses a wide band of topographical relief. Elevations at the south end of Balm Creek near its confluence with the main stem of the Powder River are approximately 2,000 feet. Elevation climbs to approximately 6,500 feet at Flagstaff Butte at the north edge of the watershed. Much of the watershed lies on slopes ranging from 35 to 60% (~60% of watershed); Aspects vary widely within the watershed with changes in vegetation evident along these aspect changes. Topography interacts with physical and biological factors within the watershed. Rainfall on steep exposed soils is a primary source of surface erosion. Vegetation patterns change as topographical conditions change. The direct altitudinal effect that results in a normal decline in temperature with an increase in elevation causes a corresponding change in plant community composition, structure, and response to fire. Slope angle also contributes to changing vegetation patterns. Slope aspect in relation to the angle of incident solar radiation affects plant communities by impacting temperature and water availability.

1.2 LAND OWNERSHIP

Table 1. Lands managed by the Forest Service or other entity and total acres per subwatershed and watershed in watersheds with Forest Service acreage within the Powder River-Pondosa (HUC 17050203-13) and Powder River-Keating (HUC 17050203-29) watersheds.

SWS/WAHHUC Number	SWS/WA NAME	Watershed AREA (acres)	FOREST SERVICE (acres)	PRIVATE, STATE & BLM (acres)
13C	Beagle Creek	13712	2917	10795
13D	Big Creek – Medical Springs	11540	1667	9873
13E	Big Creek – Big Creek Ditch	7535	4779	2756
13F	Upper Big Creek	15220	14608	612
13H	Cusick Creek	8753	4	8749
13I	Antelope Creek	16133	114	16019
29B	Lower Goose Creek	6557	504	6053
29C	Middle Goose Creek	18148	12064	6084
29D	Upper Goose Creek	5669	4977	692
29E	Balm Creek	12722	5435	7287
29F	Clover Creek	9640	1661	7979
29H	Tucker-Houghton Creeks	12252	1586	10666
13	Powder River-Pondosa	79699	24089	55610
29	Powder River-Keating	64988	26227	38761
TOTAL		**144687**	**50316**	**94371**

The watershed covers 144687 acres of federal, private, and state lands. The U.S. Department of Agriculture Forest Service (USFS) and the Bureau of Land Management (BLM) share federal management of the watershed with 50,316 acres and 2,445 acres, respectively. Private landowners hold 11,927 acres; the State of Oregon owns approximately two acres (

1.2.2 USDA Forest Service Management Areas

Powder River Watershed Assessment Management Area Acres within Watersheds		
Wallowa Whitman LRMP Management Areas	**Watershed Name**	**Acres**
3	Powder River/Keating	11,631.99
1W	Powder River/Keating	2,546.34
16	Powder River/Keating	37.35
15	Powder River/Keating	952.37
1	Powder River/Keating	14,700.37
6	Powder River/Pondosa	0.00
3	Powder River/Pondosa	8,684.05
15	Powder River/Pondosa	788.52
1	Powder River/Pondosa	16,834.98
	Total Management Area Acres within the Powder River Watershed Assessment Area	**56,175.97**

1.3 SOILS

1.3.1 Soil Descriptions

In the watershed, soils occur in ten Landtype Associations (LTAs). These mapped LTAs correspond to mapping completed for the Soil Resource Inventory using Terrestrial Ecological Units (TEU) for the Wallowa-Whitman National Forest (WWNF *2002*). The LTAs are a product of the interaction between soils, geology, landforms, vegetation and climate. Soils are described in relationship to the LTAs where they occur (Table ___).

NEED WATERSHED ACRES BY LANDTYPE ASSOCIATION IN WATERSHED

Table ___. Landtype Association Descriptions

LandType (LTA)	Geology	Landform	Slope Gradient	Vegetation	Soil Series	Total Acres
116	Basic Igneous	Gentle Slopes	0 to 30 %	Moist Forest	Limberjim-Syrupcreek-Troutmeadows-Mountemily	
117	Basic Igneous	Steep Slopes	30 to 60 %	Moist Forest	Limberjim-Mountemily-Bennetcreek-Rebarrow-Syrupcreek	

166	Exotic Terrane	Gentle Slopes	0 to 30 %	Moist Forest	Bordengulch-Threecent-Wahoogulch	
167	Exotic Terrane	Steep Slopes	30 to 60 %	Moist Forest	Gutridge-Honeymooncan-Twobit- Marblecreek	
216	Basic Igneous	Gentle Slopes	0 to 30 %	Dry Forest	Larabee-Bennetcreek-Wonder	
217	Basic Igneous	Steep Slopes	30 to 60 %	Dry Forest	Klickson-Larabee-Bigcow	
266	Exotic Terrane	Gentle Slopes	0 to 30 %	Dry Forest	Kamela-Anatone	
267	Exotic Terrane	Steep Slopes	30 to 60 %	Dry Forest	Wahoogulch-Hawgrose-Payraise	
316	Basic Igneous	Gentle Slopes	0 to 30 %	Dry NonForest	Anatone-Bocker	
367	Exotic Terrane	Steep Slopes	30 to 60 %	Dry NonForest	Hondu-McWillar	

The number of acres of landtypes indicated in the table above is not exact, but has been condensed and rounded to indicate relative amounts of major landtypes. Also, the LTAs in the analysis area are complexes and are made up of several soil series. The major soil series were used to determine the soil properties of the LTA and the minor and other soil series were considered but not used.

Landtype 116

This LTA consists of andesitic and Columbia River basalts with gentle sloping hills and plateau surfaces less than 30% and supports moist forests with some dry forest and dry grass. This soil is a deep silt loam ash that occurs on stable ridgetops and sideslopes of the plateaus and the backslopes of mountains.

Landtype	**Major Soil Series**	**Soil Depth**	**Surface Texture**	**K factor**	**Bulk Density**	**Drain-age Class**	**Erosion Hazard Rating**
116	Limberjim	40-60	Gravely Silt loam	.24	.65 - .85	Well	Low
117	Limberjim	40-60	Gravely Silt loam	.24	.65-.85	Well	Low
166	Bordengulch	20-40	Loam	.28	.65-.85	Well	Low
167	Gutridge	40-60	Loam	.24-.32	.65-.85	Well	Low
216	Bennetcreek	20-40	Silt loam	.24-.37	.75-.95	Well	Low
217	Bigcow	40-60	Gravely Silt loam	.24	.65-.85	Well	Low
266	Kamela (Anatone)	30	Gravely loam	.10-.15	1.2-1.7	Well	Mod
267	Wahoogulch	20-40	Silt loam	.24	.65-.85	Well	High
316	Anatone	10-20	Cobbly Silt loam	.10-.15	1.2-1.7	Well	Mod
367	Hondu	60	Loam	.20-.24	.65-.85	Well	Low

Landtype 117

This LTA consists of Columbia River basalts with steep slopes greater than 30% and supports moist forest with some dry forest and dry grass. This soil is a deep silt loam ash that occurs on stable ridgetops and sideslopes of the plateaus and the backslopes of mountains.

Landtype 166
This LTA consists of metasediments on gentle sloping hills less than 30% and supports moist forests. This soil is a moderately deep loamy ash that occurs on the upper backslopes, shoulders and ridges of mountains.

Landtype 167
This LTA consists of metasediments on steep sloping hills greater than 30% and supports moist forests. This soil is a deep loamy ash high in gravel that occurs on mountain sideslopes.

Landtype 216
This LTA consists of andesitic and Columbia River basalts with gentle sloping hills less than 30% and supports dry forests with some portions of dry grass and dry shrubs. This soil is a moderately deep ash soil that occurs on the backslopes of mountains.

Landtype 217
This LTA consists of Columbia River basalts with steep slopes greater than 30% and supports dry forests and dry forests with some portions of dry grass and dry shrubs. This soil is a deep ash soil that occurs on the backslopes of mountains.

Landtype 266
This LTA consists of metasediments on gentle sloping hills less than 30% and supports dry forests and dry forests with some portions of dry grass. The major soil series associated with the LTA was *Kamela* and *Anatone* and is a combination of the two dominantly *Anatone* combined with *Kamela* characteristics. This soil is a moderately deep rocky loam with an ash influence that occurs on ridgetops and sideslopes of mountains.

Landtype 267
This LTA consists of metasediments on steep sloping hills greater than 30% and supports dry forests. This soil is moderately deep gravely silt loam ash that occurs on mountain sideslopes.

Landtype 316
This LTA consists of andesitic basalts with gentle sloping hills less than 30% and supports dry grass or dry non-forests. This soil is a shallow cobbly silt loam that occurs on sideslopes and plateaus.

Landtype 367
This LTA consists of metasediments on steep sloping hills greater than 30% and supports dry shrubs or dry non-forests. This soil is a very deep loamy ash, high in rock that occurs on mountain sideslopes.

1.3.2 Soil Productivity

Soil productivity of a site is defined as the ability of a geographic area to produce vegetative biomass, as determined by conditions (e.g. soil type and depth, rainfall and temperature) in that area. Specifically as related to soils in this analysis, productivity is related to the capacity or suitability of a soil for establishment and growth of specified plant species, primarily through nutrient availability.

The productivity of forest soils can be adversely affected by removal of nutrients and alterations in the soil structure. Removal of nutrients can occur through the removal of vegetation (i.e. trees, shrubs and grasses), erosion, preparation of sites for treatment and burning. The effects of soil disturbance on soils productivity and the duration of adverse effects largely depend upon the type of disturbance. Disturbances such as roads and ditches generally are permanent because the soil structure is severely altered during construction. Compaction from tractor yarding can potentially last for several decades *(Froehlich and McNabb, 1984)*, thereby reducing productivity. Soil surface erosion rates following timber harvest can potentially remain elevated for two to seven years, depending upon the yarding method. The effects of nutrient removal through woody debris removal, erosion, burning and site preparation can be short lived, or long lasting depending upon the extent, duration and intensity of the disturbance.

1.3.3 Sheet and Rill Erosion

Soil erodibility is a function of detachability, infiltration rate, permeability of lower horizons, uniformity of slope and slope percent, water concentration potential, distribution of annual precipitation, rainfall intensities, soil temperatures, and the density of effective ground cover following disturbance. Soil erosion is a natural process that can be accelerated by land management activities. Soils on steep slopes with poor vegetative cover and lack of structural development are more susceptible to erosion than are soils on flatter terrain. Vegetation protects the soil surface from raindrop impact, dissipates the energy of overland flow, and binds soil particles together.

The major soil complexes represented within the analysis area exhibit moderate permeability rates and are well drained. Mean annual precipitation averages 20 to 40 inches per year, primarily in the form of snow with some spring and fall rains and summer storms. Slopes within the watershed analysis area range from 0 to 60 percent. Existing established ground cover was good to excellent.

1.3.4 Gully and Landslide Erosion

Surveys of the the watershed analysis area by the District Hydrologist and Forest Soil Scientist concluded the analysis area is generally a stable landscape and that the potential for landslides to occur is relatively low. An old natural landslide in Lick Creek drainage was surveyed and it appeared to be stabilized at this time. Numerous intermittent tributaries and ephemeral swales were found within the analysis area. A few channels have been logged, used as skid trails, and grazed. Despite the past logging and skidding operations, the swales have good reestablishment of vegetation and ground cover and are not showing signs of channel development. Vegetation regrowth and biological activity is breaking up some of the surface compaction (0 to 3 inches) of soil on the historic skid trails and closed roads.

1.3.5 Organic Matter and Large Woody Material

Nutrient recycling and decomposition rates are slow considering the relatively warm-dry environment. Soil nutrients are primarily replenished through the decomposition of organic matter and root turnover. Organic matter (surface litter and duff) depth approximates 0.2 to 4.0 inches within the watershed analysis area. Ground cover, generally consisting of matted pine grasses, heartleaf arnica, woods strawberry, common snowberry (warm/dry habitats), big huckleberry prince's pine and twin flower (cool/dry habitats), and shade tolerant conifer seedlings is well established in the disturbed areas within the forested portions of the watershed analysis area. On the droughty scab soils, lichens, mosses, and to a lesser extent pine grass leaves and crowns account for a high portion of the surface litter.

Amounts of down woody material (over 12 inches in diameter at the small end and at least 6 feet in length) are variable across the watershed analysis area. Potential future down wood recruitment from standing dead trees depends upon their location relative to firewood cutting access.

1.3.6 Detrimental Soil Conditions

The Forest Plan defines detrimental soil condition as any management practice that results in soil compaction, puddling, displacement, erosion, mass wasting or severe burning. Soil damage can negatively affect the productivity of a site. Previous entries for timber harvest slash disposal, road building, mining, firewood cutting, and livestock grazing have resulted in varying degrees of soil disturbance within the watershed analysis area. Detrimental soil conditions (DSCs) for project work are to be minimized, with total acreage detrimentally impacted not to exceed 20 percent of the total acreage within an activity area. Post treatment restoration is necessary for areas that exceed this standard and guide. (*Forest Plan, Page 4-21*).

The watershed analysis area has had a relatively high amount of management activity, primarily due to favorable accessibility. The road network is extensive and multiple entries over many decades have occurred for timber harvest and other purposes. Residual soil disturbance is rather wide spread in extent, though not particularly intensive in degree. Much of the harvest in the watershed analysis area selected individual trees for removal. Old skid trails and stock driveways, are still evident where soil was compacted, displaced or rutted from continued machinery or recreational traffic.

In the watershed analysis area soil compaction is the primary disturbance factor. The majority of the watershed analysis area was conventionally logged historically (utilizing both rubber tired and tracked skidders) and hand felled. Skid trails were not predesignated and randomly occur throughout the old units. Main skid trails were spaced approximately 50 to 100 feet apart. Evidence of old compaction (plated surface soils) is being ameliorated by the established root systems of pine grass, arnica, various clovers, yarrow, woods strawberry, snowberry, and tolerant conifers. Exposed mineral soil does not excessive within revegetated skid roads; that is skid trails have a high percent of ground cover.

Soil displacement is defined as the movement of soil from one place to another by mechanical forces such as a wheel, blade or animal hoof. Some displacement occurred in a recent soil resource survey. This form of disturbance was evident where machinery had sharply turned or where previous harvesting had occurred during periods of wet or moist soil conditions. As was evident in areas with compaction, locations of soil displacement were revegetated with a high percent of ground cover. A number of sampled areas in the watershed analysis area during recent soil surveys had displacement that occurred during logging on steep slopes, but which only occurred on 10% of the area.

Soil puddling is a concern when areas that are to be winter logged experience a thaw that reduces the protective barrier of snow below a 2-foot depth or frozen ground is less than 6 inches in depth, or where soils are ground based logged under wet or very moist spring, summer or fall conditions. Puddling was only observed in isolated locations in association with roads where vehicles had used the unimproved road surface during wet conditions.

Soil quality conditions in a recent soil resource survey were assessed using Protocol for Assessment and Management of Soil Quality Conditions (WWNF 2004). Transects (Level 2 survey) and/or observations (Level 1 survey) were made for the survey by a Soil Scientist or District Silviculturist.

Soil quality conditions were assessed in the watershed analysis area using Protocol for Assessment and Management of Soil Quality Conditions ver. 3.6 (WWNF 2004). Transects and/or observations were made in all proposed harvest units for the Bald Angel project, which covers much of the watershed analysis area. Conditions were assessed continuously along transects. In areas where adverse soil conditions were observed to be non-existent or very low (0-2%), an estimate of detrimental soil conditions was made to the nearest percent. Conditions in impacted and unimpacted areas of units were averaged.

DSCs from system roads were excluded from transects. Road mileage was determined for NF land in the analysis area by GIS. GIS road mileage for each proposed harvest unit and prescribed fire unit was adjusted by excluding all roads that were adjacent to the units unless they were shared between units. The adjustment process was done with a map wheel. Road mileage was converted to road acreage. Percent existing soil disturbances (DSCs), acres of logging systems, prescriptions and soil landtypes in proposed silviculture and prescribed fire units were calculated and summarized in Table __. Road mileage data for units was converted to acres using the formula, [(miles) times (acres/mile) = acres].

For recent project surveys in the watershed analysis area, soil disturbance (DSCs) in proposed silviculture and prescribed fire units currently ranged from 0% to 14.2. DSCs in proposed non-commercial silvicultural treatment units were less than 9%. DSCs in all units were below the 20% affected-area threshold, so soil quality was being maintained in at least 80% of the area of each proposed activity unit as required by Region and Forest Plan standards.

1.4 CLIMATE

1.4.1 Air Temperatures

Average maximum air temperature for the watershed isXXXX at XXXXXX

1.4.2 Precipitation

Most of the precipitation across the watershed falls as snow. The nearest snowpack data with a long period of record is a Taylor Green (elevation 5853) at the uppermost point of SWS 13F. Maximum water content of the snowpack occurs near the first of April when about XXinches of water lies across the mid and upper elevations.

1.4.3. Climate Trends

1.5 AQUATIC AND RIPARIAN RESOURCES

1.5.1 Watersheds

Table ___ shows the watersheds and sub-watersheds within the watershed analysis area. Forest Service lands administered by the Wallowa-Whitman National Forest were analyzed in the Powder River-Keating (17050203-29) and Powder River-Pondosa (17050203-29) watersheds.

Table ___. Lands managed by the Forest Service or other entity and total acres per subwatershed and watershed in watersheds with Forest Service acreage within the Powder River-Pondosa (HUC 17050203-13) and Powder River-Keating (HUC 17050203-29) watersheds .

SWS/WA HUC Number	SWS/WA NAME	DRAINAGE AREA (acres)	FOREST SERVICE (acres)	PRIVATE, STATE & BLM (acres)
13C	Beagle Creek	13712	2917	
13D	Big Creek – Medical Springs	11540	1667	
13E	Big Creek – Big Creek Ditch	7535	4779	
13F	Upper Big Creek	15220	14608	
13H	Cusick Creek	8753	4	
13I	Antelope Creek	16133	114	
29B	Lower Goose Creek	6557	504	
29C	Middle Goose Creek	18148	12064	
29D	Upper Goose Creek	5669	4977	
29E	Balm Creek	12722	5435	
29F	Clover Creek	9640	1661	
29H	Tucker-Houghton Creeks	12252	1586	
13	Powder River-Pondosa	79699	24089	
29	Powder River-Keating	64988	26227	
TOTAL				

1.5.2 Instream Habitat and Channel Conditions

The following is a summary of the existing condition of instream habitat, riparian vegetation, water quality, stream flow regimes, and fish populations, for the watershed. The watershed analysis area is within NFS watersheds 17050203-13 (Powder River-Pondosa) and 17050203-29 (Powder River-Keating) and includes the following subwatersheds listed in Table ___.
Region 6 classifies streams based on type of flow and presence or absence of fish. Class I streams are permanently or intermittently flowing and fish bearing, Class II streams are permanently or intermittently flowing and fish bearing of limited numbers of fish, Class III streams are permanently flowing and non-fish bearing, Class IV streams are intermittently flowing and non-fish bearing and Class V or E streams have ephemeral flow duration and are non-fish bearing. The major streams that drain the analysis area are Big Creek, Balm Creek, Burn Creek, Conundrum Creek, Lick Creek, Velvet Creek, Alder Creek, Tucker Creek, Goose Creek and Clover Creek.

Table ___ shows the existing condition of instream habitat for some of the primary streams located within the analysis area. This information was obtained from the stream survey database at the LAG RD and is based on surveys completed from 1991-1996. Survey information was collected utilizing the Hankin and Reeves methodology as modified by the PNW R6 Regional Office.

Table ___. Existing condition of instream habitat for primary streams within the watershed.

Stream	SWS	Survey Length (miles)	Pool Freq. (per mi)	Channel Width (feet)	Bank Stability (%)	W/D Ratio	LWD (pieces/ mi)	Fish Species
Big Creek	13E &F	6.9	27	9.7	80%	11.4	21	Rainbow trout and Suckers

Burn Creek	13E	3.1	20	4.6	83%	5.3	9	Rainbow trout and sculpin
Conundrum Creek	13F	2.3	22	5.0	52%	8.4	56	Rainbow trout and sculpin
Lick Creek	13F	3.6	19	6.3	57%	5.7	37	Rainbow trout
Velvet Creek	13F	4.6	26	7.9	53%	9.9	74	Rainbow trout and sculpin
WF Goose Creek	29D	3.5	14	7.8	75%	11.6	33	Rainbow/Redb and trout and sculpin
Balm Creek	29E	13.5	19	8.0	83%	13.6	29	Rainbow/Redb and trout

There are no federally listed fish species in the analysis area. Miles of stream per stream class within the analysis area are listed by subwatershed and watershed in Table __. In addition to the surveyed streams, there are XXX miles of perennial fish bearing, XXX miles perennial and intermittent non-fish bearing and XXX miles of ephemeral draws within the watershed analysis area (Table ___). Of the total miles of stream in the analysis area, X% are perennial fish bearing, XX% are perennial and intermittent non-fish bearing and XX% are ephemeral draws.

Wetted Width to Depth Ratio – Channel width to depth ratio is a measure of the channel's ability to transport streamflow and sediment. The INFISH RMO for width to depth ratio is less than 10. This ratio is based on the mean wetted width divided by mean depth. Of the seven primary streams surveyed within the analysis area, Burn Creek, Conundrum Creek, Lick Creek and Velvet Creek had width to depth measurements less than 10 and Big Creek, WF Goose Creek and Balm Creek all measured greater than 10.

Pool Frequency – Pool habitat is beneficial for fisheries and channel maintenance such as sediment deposition and energy dissipation. INFISH RMOs for the number of pools per mile vary according to the wetted channel width. A stream with a wetted channel width of 10 feet has an objective of 96 pools/mile and a stream with a wetted channel width of 20 feet has an objective of 56 pools/mile. The wetted width of all streams within the analysis area is below 10 feet. All streams within the analysis area are well below the objective of 96 pools/mile and are considered in poor condition.

Large Woody Debris (LWD) – Large wood creates pools, stores sediment, and is an important component for stream structure. The INFISH RMO for large woody debris is greater than 20 pieces per mile greater than 12 inches diameter and greater than 35 feet in length. Existing levels of LWD in the streams surveyed within the analysis area met the INFISH RMO for pieces of large woody debris per mile except Burn Creek, which only measured nine pieces per mile. Big Creek and Balm Creek met the RMO at 20 pieces per mile.

Streambank Stability – The INFISH standard for streambank stability greater than 80% stable stream banks. Conundrum Creek, Lick Creek, Velvet Creek and WF Goose Creek all had less than 80% stable banks and Big Creek, Burn Creek and Balm Creek all measured greater than or equal to 80% stable banks.

NEED TO PROVIDE UPDATED NUMBERS FROM GIS FOR WATERSHED AND UPDATE IN TEXT DISCUSSION

Table ___. Miles of streams per stream class in watershed analysis area by subwatershed and watershed**.**

SWS/WA	SWS/WA NAME	Class I Streams (miles)	Class III Streams (miles)	Class IV Streams (miles)	Class V or E Streams (miles)
13C	Beagle Creek				
13D	Big Creek – Medical Springs				
13E	Big Creek – Big Creek Ditch				
13F	Upper Big Creek				
29B	Lower Goose Creek				
29C	Middle Goose Creek				
29D	Upper Goose Creek				
29E	Balm Creek				
29F	Clover Creek				
29H	Tucker-Houghton Creeks				
13	Powder River-Pondosa				
29	Powder River-Keating				
TOTAL					

1.5.2 Riparian Vegetation

Streams surveyed in the analysis area were dominated by a sapling/pole size overstory and grass/forb understory with some reaches supporting large mature trees . This riparian vegetation type, in general, provides low levels of future recruitment of LWD and is succeptible to becoming over stocked with small trees resulting in a supression of the release of resources for tree growth and stable riparian type vegetation (i.e. shrubs, sedges and rushes). The cover measured on the surveyed streams were, on average, providing 60% shade and low to moderate (21% to 40%) fish hiding cover.

Table ___ shows the percent of forested acres that are understocked, adequately stocked and overstocked stands in riparian buffers for each subwatershed within the watershed analysis area. Stands that are adequately stocked are growing at full potential and provide sufficient canopy cover, root mass, evapotranspiration, and recruitment material for proper hydrologic functions. Adequately stocked stands are also less susceptable to risk of catestrophic fire and infestations of insects and disease. All of the subwatersheds in the watershed analysis area have 20% or less of RHCA stands in an adequately stocked condition. The potentially overstocked stands in the riparian buffers need to be ground truthed to determine the type of trees contributing to the level of overstocking and the amount of LWD in the channel and standing for future recruitment.

Table ___. Percent of forested acres of understocked, adequately stocked, and overstocked stands in riparian buffers for each subwatershed within the watershed analysis area.

SWS	Stocking Levels		
	Understocked (%)	Adequately Stocked (%)	Overstocked (%)
13B			
13C			
13D	9	14	77
13E	23	13	64
13F	29	20	51
13I			
13H			
29B			
29C			
29D	44	18	38
29E	27	16	56
29F	24	8	68
29H	31	15	54

*Note: Information on stand density within the EVEG database is up to 15-years old.)

1.5.3 Water Quality

Stream Temperature - INFISH RMO for water temperature requires compliance with state water quality standards, or a maximum 7-day running average of less than 68 oF. The Oregon Department of Environmental Quality (ODEQ) water quality standard for temperature is based on the maximum 7-day running average that is not to exceed 68 of in surface waters that contain redband trout, which is found in the watershed analysis area.

Oregon Department of Environmental Quality (ODEQ) 303 (d) Listed Streams - The ODEQ assigns specific standards for water quality parameters based on beneficial uses. Water bodies that do not meet State standards are generally listed as water quality-limited streams under section 303(d) of the Clean Water Act. Beneficial uses of water in the watershed analysis area include stock watering, irrigation, and resident fish and aquatic life. There are no streams listed on the ODEQ 303 (d) list as water quality limited in the watershed analysis area. A TMDL Water Quality Management Plan (WQMP) is in the process of being developed for the Powder Basin. Once the TMDL is developed and approved all management activities on federal lands managed by the USDA Forest Service in the Powder Basin will continue to follow standards and guidelines (S&Gs) as listed in the LRMP, as amended by INFISH (USFS 1995), Best Management Practices (BMPs) as defined in various Federal and State laws such as the Implementation Plan for 208 (Water Pollution Control Act, PL 92-500, as amended), and Specific Stand Management Unit (SMU) Constraints and Mitigation Measures identified in the Wallowa Whitman NF Watershed Management Handbook.

Erosion and Sedimentation - Roads provide a substantial source of sediment and a mechanism for delivering sediment to the stream systems. The amount varies by density, location and condition of roads. INFISH Standards and Guidelines for existing roads within RHCAs include minimizing sediment delivery to streams from the road surface; closing and stabilizing, or obliterating and stabilizing roads not needed for future management activities; improving stream crossings to accommodate a 100-year flood; and providing and maintaining fish passage at all road crossings of existing and potential fish-bearing streams.

The road densities in the subwatersheds in the watershed analysis area range from 1.1 mi/mi2 to 7.3 mi/mi2 and for the entire analysis area is 3.3 mi/mi2 (Table ___). An inventory of valley bottom roads begin with roads within RHCA buffers and are followed up by a ground truth as to their effect on the riparian area. The inventory of potential valley bottom roads within RHCA buffers in the analysis area resulted in approximately 233 miles of existing roads (open, closed, FS and Non-FS). The District uses the NOAA Fisheries conservation recommendation from the 1996 BO for LRMPs for open and closed road density for steelhead habitat of less than 2 miles per square mile and no valley bottom roads per entire subwatershed as a guide to assess the hydrologic function of the subwatersheds included in the analysis area. Roads within RHCA buffers can reduce the effectiveness of buffering capacity, provide active sources of sedimentation, negatively affect terrestrial inputs to riparian areas, decrease riparian habitat. Road reconstruction, closure and/or decommissioning have the potential to reduce the sediment potential and improve fisheries habitat.

Table ___ displays the existing miles of open and closed Forest Service (FS) and non-FS roads and total road density for the watershed analysis area. There are approximately XXX miles of road within the watershed analysis area. Approximately XXX miles of Forest Service roads are currently open to vehicle travel, and XXX miles are closed. Approximately XXX miles of existing roads are located within RHCAs in the analysis area, including approximately 100 miles of open FS roads.

TABLE NEEDS GIS QUERY

Table ___. Total existing lengths (miles) and densities (miles/square mile) of roads in the watershed analysis area.

	WATERSHED ANALYSIS AREA			
SWS/WA	Drainage Area (mi2)	Total NON-FS Roads (mi)	Total FS & NON-FS Roads (mi)	SWS Road Density (mi/mi2)
13B				
13C				
13D	18.0	13.2	23.6	1.3
13E	11.8	2.7	49.1	4.2
13F	23.8	0.0	97.2	4.1
13I				
13H				
29B				
29C				
29D	8.9	0.4	64.6	7.3
29E	19.9	9.5	59.2	3.0
29F	15.1	10.5	24.9	1.6
29H	19.1	7.1	21.8	1.1
13	53.6	15.9	169.9	3.2
29	63.0	27.5	170.5	3.3
Total	116.6	43.4	340.4	3.3

1.5.4 Streamflow Regime

Streamflow discharges in subwatersheds 13D, 13E, 13F, 29D, 29E, 29F and 29H are characteristic of a snowmelt hydrograph, with late spring and fall rains contributing to the annual average flows. Peak flows usually occur in May and June with flows gradually decreasing to minimum discharges in late August and September.

The existing Equivalent Clearcut Acres (ECA) calculated for subwatersheds 13D, 13E, 13F, 29D, 29E, 29F and 29H are reported in Table ___. The methodology used to determine the existing acres in clearcut equivalent condition for the above subwatersheds are outlined in Appendix D in the 1999 UGRRAA BA on file at the LAGRD. All of the existing ECA values are below 15% for all of the subwatersheds included in the watershed analysis area. These ECA values do not include adjacent private land harvests. ECA will be used only as an indicator of overall disturbance in the watershed analysis area, and will not be used to describe hydrologic response.

Table ___. Percent of forested acres in Equivalent Clearcut Acres (ECA) for each FS subwatershed in watershed analysis area.

SWS	Existing ECA %
13B	
13C	
13D	3.7
13E	10.0
13F	7.3
13I	
13H	
29B	
29C	
29D	9.6
29E	7.3
29F	8.8
29H	11.5

1.5.5 Fish Species and Distribution

There are no listed fish species or designated critical habitat within the analysis area. The USDA Forest Service Regional Forester's (Region 6) candidate 2 sensitive species redband trout (O. mykiss gibbsi) are found on the La Grande Ranger District and are in the watershed analysis area. Little is known of the distribution of redband trout within these subwatersheds. There are approximately 30 miles of fish bearing streams out of 85 miles of perennial streams in the analysis area.

Non-game fish species such as sculpins (Cottus sp.) and suckers (Catostomus sp.) are also present within the analysis area.

1.5.6 Overall Fish and Watershed Condition

In the watershed analysis area all seven subwatersheds (SWS) were identified as "Functioning Appropriately" (FA) for water quality and disturbance history (ECAs); five SWS were identified as FA, one "Functioning at Risk" (FAR) and one 'Functioning at Unacceptible Risk" (FAUR) for physical barriers that block fish passage; six SWS were identified as FA and one as FAR for large woody debris; all seven SWS were identified as FAUR for pool frequency; three SWS were identified as FA, two SWS as FAR and two as FAUR for streambank stability; six SWS were identified as FA and one as FAR for width/depth ratio; and, three SWS were identified as FA and three as FAUR for road density and location (Table ___). The majority of the SWSs are FA with a few of the SWS FAR and FAUR that have high road densities, drawbottom roads, and irrigation ditches that are blocking fish passage.

Table ___. Steelhead matrix (surrogate for redband trout) for comparison of existing condition and RMOs for SWS 13D, E, F, 29D, E, F and H that are included in the watershed analysis area.

Diagnostic or Pathway	Functioning Appropriately (FA)	Functioning at Risk (FAR)	Functioning at Unacceptable Risk (FAUR)	Data Source
Water Quality				
Stream Temperature	ALL			Datalogger, ODEQ 303 (d) list
Habitat Access				
Physical Barriers	13D, F 29D, F, H	29E	13E	Special Use Permits
Habitat Elements				
Large Woody Debris	13D, F 29D, E, F, H	13E		Stream survey
Pool Frequency			ALL	Stream survey
Channel Condition				
Streambank Stability	13D 29F, H	13E 29E	13F 29D	Stream survey
Width/Depth Ratio	13D, E, F 29D, F, H	29E		Stream survey
Watershed Condition				
Road Density & Location	13D 29F, H		13E, F 29D, E	GIS, ATMS
Disturbance History (ECA)	ALL			ECA model

Other Information

Wetlands – Wetlands, seeps and springs are abundant in the mixed conifer stands of the analysis area and consequently not all have been identified. All wetlands, seeps and springs will be located and protected during the layout process.

Fisheries and Watershed Enhancement Projects - The headwaters of Conundrum Creek have received protection with biomat on the streambanks and is designated as a Protection Investment (PI).

Water Rights – Water rights in the analysis area need to be identified and protected. The National Forest System has reserved water rights on certain portions of their proclaimed lands. A map showing proclaimed and acquired lands are available at LAG RD. There are two major irrigation ditches running through the watershed analysis area; Big Creek Ditch and Trout Creek Ditch and the Balm Creek Reservoir that is fed by a network of ditches and Balm Creek.

1.6 VEGETATION

1.6.1 Introduction

A total of 59,578 acres of National Forest System (NFS) lands was considered in the vegetation analysis of the 73,954-acre Powder River Keating/Pondosa watershed. The remaining 14,346 acres under non-federal management were not considered in the quantitative analysis because no current or complete data were available. It is recognized that this analysis has a bias toward federal land, which is a limitation in an ecosystem analysis at the watershed scale. This analysis addresses the vegetation within only ~81% of the entire watershed, most of which is located at higher elevations and is more isolated from direct, high-frequency and high-intensity human uses including urban areas, rural housing, agriculture, and livestock grazing. As a result, it is stressed that, while this analysis offers an in-depth examination of the composition, structure, and functioning of the vegetation in the Powder River Keating/Pondosa watershed, the vegetation outside the NFS lands and within areas that are important to aquatic, terrestrial, and cultural resources will be inadequately represented.

1.6.2 Management Practices Defining the Watershed

Not unlike other watersheds in the Blue Mountains, the Powder River Keating/Pondosa watershed has been subject to a history of land-use practices since the 1850.s. Practices including beaver trapping, mining, timber harvest, fire suppression, and fire exclusion have altered how the landscape has functioned in a variety of confounding ways. The removal of beaver and gold mining has altered the structure and complexity of stream habitat; timber harvest and the exclusion of fire have changed the way forests are structured, and how they respond to natural disturbances. The combined effects of timber harvest and fire exclusion have altered the vegetation composition and structure of the landscape the most profoundly. Removal of large-diameter overstory trees has promoted dense understory growth (overstocking) and has resulted in slow growth and poor vigor where post-harvest thinning has not occurred. Overstocking and growth stagnation render higher incidence of mortality due to bark beetles, defoliating insects, diseases such as dwarf mistletoe, and root rots (Cochran and Barrett 1998). Fire exclusion complicates this condition, especially in ponderosa pine forest types, as many ecosystem functions and attributes are changed with the removal of such a keystone disturbance process, including abundances and responses to insects and disease, landscape-level behavior of wildland fires, animal plant interactions, nutrient cycling, productivity, and biodiversity (Keane et al. 2002). Many effects of fire exclusion are noticeable, including elevated levels of insects and disease, higher conifer densities in shrublands and grasslands, and dense understories of shade-tolerant species in otherwise open forests.

1.6.3 Fire as a Disturbance Process

Natural and human disturbances are important processes that shape the structure and composition of the Powder River Keating/Pondosa watershed. Natural disturbances include fire, insects and diseases, winds, and ice storms. In addition, floods and ice floes are important disturbances in riparian and stream ecosystems. Historic and current anthropogenic disturbances include livestock grazing, logging, mining, and roads. The exclusion of fire as a management practice is an anthropogenic disturbance that has had dramatic influences on natural disturbances that contribute to watershed structure and functioning. Historically, fire has been the most widespread disturbance in the Powder River Keating/Pondosa watershed. Evidence of past fires can be found in uplands and riparian zones throughout the watershed. However, wildland fires are not a uniform influence; the nature of fire is quite variable in the Powder River Keating/Pondosa watershed because of the interactive effects of differences in elevation, climate, aspect, and parent materials.

1.6.4 The Fire Regime

The fire regime is defined as the regular pattern and occurrence of fire in a given ecosystem (Brown et al. 2001). Agee (1993) described fire regimes as a gradient of low, moderate and high severity fire regimes. Frequent, low intensity surface fires with a return interval of five to 25 years characterize low severity fire regimes. Fuel accumulations rates (litter, grasses and other fine fuels) are quite high in this fire regime. Low intensity regimes are generally found at lower elevations where, for the majority of the fire season, fuel moisture contents are below the moisture of extinction (i.e., a level where moisture contents are low enough to sustain the spread of wildfire). Ponderosa pine forests typify this fire regime in the Powder River Keating/Pondosa watershed. Fire exclusion, logging and livestock grazing have interacted to create dramatic alterations in fuel loads and fuels structure (Arno et al. 1997). Fire exclusion has resulted in increased fuel loads in both second-growth and old growth forests. With a probable historic fire-return interval of five to 15 years, as many as 10 fire cycles have been eliminated from this ecosystem. As the biota is adapted to frequent fires, this has important influences on biodiversity as well as fuel buildups and wildland fire hazards. Moderate severity fires are those with an intermediate return interval (35 to 75 years) and a variable fire severity. Fires in this fire regime are often characterized as low severity surface fires. Occasionally, long-return interval fire results in a complete stand replacement. Typically, wildland fires in this regime are largely understory fires except when local fire weather and fuels interact to create periods of high severity (standreplacing fires). Douglas-fir and mixed conifer forests typify this fire regime in the Blue Mountains of Oregon. Fires may also be limiting by fuel breaks associated with ridgelines, bare rock, snow fields, and wet meadows.

1.6.5 Fire and Vegetation Structure

Forest structure and composition has a pronounced influence on wildland fire (Kauffman 1990). In low severity regimes, historic forest composition has been characterized as an uneven-aged mosaic of even-aged stands. The frequent surface fires maintained low levels of fuels and a wide separation between surface and canopy fuels (aerial fuels). Fire exclusion has resulted in an increase in surface fuels (litter, duff, downed wood). Fuel arrangement or structure has also been altered. The combined effects of timber harvest and fire exclusion have resulted in the formation of a conifer mid-story often of shade tolerant/ fire intolerant species, such as grand fir. This mid-story functions as a source of ladder fuels where fire continuity is bridged between the understory and the canopy fuels. In this scenario, the fire regime has been altered from frequent low intensity surface fires to long return interval severe, stand-replacing fires. The intensity of timber harvest and degrees of overstocking as a result of timber harvest have pronounced effects on the continuity of fire in this fire regime. Moderate severity fire regimes have a diverse composition and structure as a response to variable fire effects. Areas of recent under-burns can be typified as forests with multiple strata of trees that established following past fire events. In other sites, the structure may be even-aged where the previous fire was severe and stand replacing. Havlina (1995) described composition and structure of forests in moderate severity regimes of the Payette National Forest. In these ecosystems, the effects of fire exclusion are less pronounced. It is likely that fire exclusion has resulted in fuel accumulations as well as increases in mid-story conifer density. Yet the magnitude of alteration since Euro- American establishment is less pronounced than forests of low severity fire regimes. Forests in the mixed severity fire regimes are often the most diverse of any forest type. Douglas-fir is frequently the dominant species. Grand fir and lodgepole pine are also common. Ponderosa pine, western larch, subalpine fir and Engelmann spruce can be locally abundant. High severity fire regimes have a forest composition of even-aged trees often in a single stratum. As the majority of the areas burned in these long-return interval fires are stand replacing, forest regeneration is often of one to three conifer species that establish in the first post-fire decade. Species most abundant in this fire regime include subalpine fir, Engelmann spruce, and lodgepole pine.

Elevation and moisture also play a role in fire history, in the past 15 years there have been no large fires on public lands in the watershed. There is approximately 53,000 acres in fire regimes 1, 2, and 3 which have a high fire return interval and 2500 acres of fire regimes 4 and 5 which are higher elevation and longer fire return intervals.

1.6.6 Wildland/Urban Interface (WUI)

The wildland/urban interface (WUI) is the line, area, or zone where human structures, activities and other developments meet or intermingle with forests, rangelands and other natural wildland areas. These areas are of particular management concern because human lives and economic investments in rural and urban areas are susceptible to wildland fires originating from adjacent forests and rangelands. In addition, the increased presence of human activities in the WUI is potential ignition sources that increase the probability of fire starts in this zone. In the Powder River Keating/Pondosa watershed, there is a small WUI under federal and non-federal management, primarily in lower elevations. For the Powder River Keating/Pondosa watershed, the WUI has been defined to be the area extending ~1.5 miles from private property boundaries. For purposes of this watershed analysis, the WUI is defined as the area that intersects with NFS lands defined as the analysis area, or approximately XXXXXX acres.

1.6.7 Noxious Weeds

The occurrence of many low priority (State listed C) noxious weed species, such as Canada and bull thistle (*Cirsium spp)* and Houndstongue (*Cynoglossum officinale*) is extensive, and these species are not routinely inventoried. These lower priority noxious weeds tend to be less persistent than the high priority weeds and while annoying and highly visual, generally give way to desirable vegetative species over time. In addition, the mitigations used to deter the spread and establishment of high priority noxious weeds are effective in the deterrence of lower priority noxious weed species.

Inventory of high priority noxious weed species, within the watershed, has been in the process for the past ten years. It is anticipated that more infestations actually occur than are inventoried.

There 66 inventoried noxious weed locations within the watershed (see attached map). Diffuse knapweed (*Centaurea diffusa*), Whitetop (*Cardaria draba*), Yellow starthistle (*Centaurea solstitialis*), Scotch thistle (*Onopordum acanthium*) are the weed species represented within these infestations. These species are rated as high priority weeds because they are invasive, persistent, and prolific reproducers. They displace desirable vegetation, and presently occur in infestations at scales which are feasible to treat.

Table 1. Powder Keating Noxious Weeds

Watershed Name	Subwatershed Name	Sub #	Weed Site Label	Plant Code	Common Name	Acres
Powder River/Keating	Balm Creek	29E	06160600001	CADR	whitetop	22.34
Powder River/Keating	Balm Creek	29E	06160600005	CEDI3	diffuse knapweed	1.47
Powder River/Keating	Balm Creek	29E	06160600211	CEDI3	diffuse knapweed	11.20
Powder River/Keating	Balm Creek	29E	06160600212	CADR	whitetop	36.14
Powder River/Keating	Balm Creek	29E	06160600226	CADR	whitetop	7.50
Powder River/Keating	Balm Creek	29E	06160600232	CADR	whitetop	8.75
Powder River/Keating	Clover Creek	29F	06160600018	CADR	whitetop	3.12
Powder River/Keating	Clover Creek	29F	06160600092	ONAC	scotch thistle	1.85
Powder River/Keating	Clover Creek	29F	06160600184	CADR	whitetop	0.08
Powder River/Keating	Clover Creek	29F	06160600223	CADR	whitetop	0.07
Powder River/Keating	Clover Creek	29F	06160600224	CADR	whitetop	3.12
Powder River/Keating	Middle Goose Creek	29C	06160700001	CEDI3	diffuse knapweed	13.60
Powder River/Keating	Middle Goose Creek	29C	06160700003	CADR	whitetop	40.62
Powder River/Keating	Middle Goose Creek	29C	06160700004	CADR	whitetop	7.17
Powder River/Keating	Middle Goose Creek	29C	06160700005	CADR	whitetop	2.76
Powder River/Keating	Middle Goose Creek	29C	06160700011	CESO3	yellow star-thistle	603.32
Powder River/Keating	Middle Goose Creek	29C	06160700013	CADR	whitetop	64.23
Powder River/Keating	Middle Goose Creek	29C	06160700021	CEDI3	diffuse knapweed	2.27
Powder River/Keating	Middle Goose Creek	29C	06160700049	CESO3	yellow star-thistle	3.87
Powder River/Keating	Middle Goose Creek	29C	06160700058	COAR4	field bindweed	3.28
Powder River/Keating	Middle Goose Creek	29C	06160700061	TACA8	medusahead	917.28
Powder River/Keating	Middle Goose Creek	29C	06160700062	CADR	whitetop	7.87
Powder River/Keating	Middle Goose Creek	29C	06160700063	CEDI3	diffuse knapweed	0.74
Powder River/Keating	Middle Goose Creek	29C	06160700069	CENTA	knapweed	6.66
Powder River/Keating	Middle Goose Creek	29C	06160700082	CADR	whitetop	2.52

Table 1 continued						
Powder River/Keating	Middle Goose Creek	29C	06160700084	COMA2	poison hemlock	0.62
Powder River/Keating	Middle Goose Creek	29C	06160700085	CYOF	Hounds tongue	7.37
Powder River/Keating	Middle Goose Creek	29C	06160700099	CYOF	Hounds tongue	3.66
Powder River/Keating	Middle Goose Creek	29C	06160700101	PORE5	sulphur cinquefoil	34.30
Powder River/Keating	Middle Goose Creek	29C	06160700102	PORE5	sulphur cinquefoil	0.96
Powder River/Keating	Middle Goose Creek	29C	06160700110	ONAC	scotch thistle	0.39
Powder River/Keating	Middle Goose Creek	29C	06160700111	CYOF	Hounds tongue	53.48
Powder River/Keating	Middle Goose Creek	29C	06160700112	CYOF	Hounds tongue	0.86
Powder River/Keating	Middle Goose Creek	29C	06160700113	CEDI3	diffuse knapweed	2.00
Powder River/Keating	Middle Goose Creek	29C	06160700116	CEDI3	diffuse knapweed	5.41
Powder River/Keating	Middle Goose Creek	29C	06160700118	PORE5	sulphur cinquefoil	1.95
Powder River/Keating	Middle Goose Creek	29C	06160700121	PORE5	sulphur cinquefoil	0.92
Powder River/Keating	Middle Goose Creek	29C	06160700142	PORE5	sulphur cinquefoil	0.08
Powder River/Keating	Middle Goose Creek	29C	06160700143	CIAR4	Canadian thistle	1.38
Powder River/Keating	Middle Goose Creek	29C	06160700169	CADR	whitetop	9.44
Powder River/Keating	Tucker/Houghton Creeks	29H	06160600228	CIAR4	Canadian thistle	0.18
Powder River/Keating	Tucker/Houghton Creeks	29H	06160600316	CEDI3	diffuse knapweed	1.05
Powder River/Keating	Tucker/Houghton Creeks	29H	06160600336	CEDI3	diffuse knapweed	6.45
Powder River/Keating	Upper Goose Creek	29D	06160600211	CEDI3	diffuse knapweed	1.47
Powder River/Keating	Upper Goose Creek	29D	06160600232	CADR	whitetop	1.08
Powder River/Keating	Upper Goose Creek	29D	06160700005	CADR	whitetop	7.19
Powder River/Keating	Upper Goose Creek	29D	06160700012	CADR	whitetop	6.69
Powder River/Keating	Upper Goose Creek	29D	06160700050	CADR	whitetop	2.38
		TOTAL ACRES				**1921.15**

Table 2. Powder Pondosa Noxious Weeds

Watershed Name	Subwatershed Name	Sub #	Weed Site Label	Plant Code	Common Name	Acres
Powder River/Pondosa	Beagle Creek	13C	06160600252	CADR	whitetop	0.01
Powder River/Pondosa	Beagle Creek	13C	06160600332	CEDI3	diffuse knapweed	0.12
Powder River/Pondosa	Beagle Creek	13C	06160600333	CEDI3	diffuse knapweed	1.80
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600004	CADR	whitetop	8.94
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600145	CEDI3	diffuse knapweed	4.21
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600146	CADR	whitetop	3.36
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600213	CADR	whitetop	4.01
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600216	CYOF	beggars lice	33.85
Powder River/Pondosa	Big Creek/Big Creek Ditch	13E	06160600229	CADR	whitetop	1.36
Powder River/Pondosa	Big Creek/Medical Springs	13D	06160600290	CEDI3	diffuse knapweed	6.34
Powder River/Pondosa	Upper Big Creek	13F	06160600125	CADR	whitetop	0.58
Powder River/Pondosa	Upper Big Creek	13F	06160600148	CADR	whitetop	1.24
Powder River/Pondosa	Upper Big Creek	13F	06160600216	CYOF	beggars lice	6.00
Powder River/Pondosa	Upper Big Creek	13F	06160600217	CEDI3	diffuse knapweed	23.06
Powder River/Pondosa	Upper Big Creek	13F	06160600230	PORE5	sulphur cinquefoil	1.24
Powder River/Pondosa	Upper Big Creek	13F	06160600267	CEDI3	diffuse knapweed	0.22
Powder River/Pondosa	Upper Big Creek	13F	06160600279	CADR	whitetop	0.11
Powder River/Pondosa	Upper Big Creek	13F	06160600368	CEMA4	spotted knapweed	7.87
			TOTAL ACRES			**104.32**

1.6.8 Botany

1.6.9 Timber Management History

Portions of the watershed were acquired from the Pondosa Logging Company in XXXXX. Silivcultural practices were generally confined to the harvest of larger Ponderosa pine

need history of management

Over 50,000 acres are in management areas 1, 1W, and 3. These management areas are where the bulk of past harvest has occurred. There have been over 4,000 acres of regeneration harvest, over 1700 acres of thinning, and over 1200 acres of other type of harvests.

1.6.10 Insects and Disease

Insects: A western spruce budworm epidemic began on the La Grande Ranger District in 1980. The watershed had minor levels of budworm and associated bark beetle caused grand fir and Douglas-fir mortality. Spruce Budworm is not currently a major problem in the watershed area, but different amounts of defoliation to trees have occurred. Much of the current damage is tree top mortality and a reduction of live crown; the understory fir component has a higher percentage of damage. Local outbreaks of mountain pine beetle, western pine beetle, pine engraver and mistletoes occurring in the watershed.

The degree of damage from insects is variable and depends upon factors such as species composition, tree size, tree vigor, and occurrence of root/bole decays. Douglas-fir bark beetle populations increased during the 1980's and caused mortality in the Douglas-fir. The Douglas-fir beetle is still active in the area. Mountain Pine Beetle and Western Pine Beetle populations are generally at endemic levels but have shown an increase in recent years. Overstocked stand conditions increase the risk of further loss of tree species. The area around Langrell Gulch (SWS 13E) has beetle populations that are at epidemic populations, mortality to ponderosa pine has increased in the last year (2004). A full analysis of the implications of insect epidemics, drought and past management activities can be found in "Blue Mountains, Forest Health Report: New Perspectives in Forest Health" (1991) .

Diseases: Tree diseases cause reduce growth rates, mortality, defect and decay. Incidence and severity of diseases in the watershed are a combination of vegetation, successional stage, and disturbance (Schmitt, 1994). A major disease in the area are dwarf mistletoes. Infected trees can have a reduction in growth, topkill, premature mortality, predisposition ot othr biotic agents and predisposition to crown fire (Schmitt, 1996). Annosus root rot and amarillaria rot are also found within the watershed.

1.7 TERRESTRIAL SPECIES AND HABITAT

The Watershed contains habitat for a wide variety of terrestrial species. These habitats have been altered from historic conditions by both human and natural processes. The majority of the watershed is within upland environments. Although comprising only XXXXX percent of the watershed, riparian areas provide important habitats for many species including osprey (*Pandion haliactus*), neotropical migratory birds, beavers, and amphibians. Most of the upland forest is in warm/dry plant associations. The upland forests may provide habitat for upland game birds, such as blue and rough grouse (*Dendragapus obscurus* and *Bonasa umbellus*), along with a wide variety of raptors including red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), Coopers hawk (*Accipiter copperii*), northern goshawk (*Accipiter gentilis*), American kestrel (*Falco sparverius*), flammulated owls (*Otus flammeolus*), and great horned owls (*Bubo virginianus*). Meadow and sagebrush habitat is limited (5%) within the watershed. More common wildlife species that may occur in the watershed include: mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus elaphus*), coyote (*Canis latrans*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), porcupine (*Erethizon dorsatum*), snowshoe hare (*Lepus americanus*), bats, chipmunks, pocket gophers, shrews, and other rodents. These species can be found in a variety of stand structures in all the biophysical environments. While it is more likely to see the aforementioned species in a typical visit to the watershed, sightings of black bear (*Ursus americanus*) and cougar *(Felis concolor*) are not uncommon. Wolverine (*Gulo gulo luteus*) is a less common species in the watershed.

1.7.1 Management Indicator Species

The management indicator species (MIS) of the Wallowa-Whitman National Forest and the habitat or habitat component that they represent are shown in table 1. All the species in table 1 are known or suspected to inhabit the analysis area, although American marten is likely represented in low numbers. The scarcity of marten in this area is likely due to a combination of inherent habitat capability and fragmentation from past logging.

Table 1: Management Indicator Species.

SPECIES	HABITAT
Pileated woodpecker (*Dryocopus pileatus*)	Old growth and mature forests
Primary cavity excavators *	Snag and log habitat
Northern goshawk (*Accipiter gentiles*)	Old growth and mature forest
Rocky Mountain elk (*Cervus elaphus*)	Arrangement of cover and forage
American marten (*Martes americana*)	Old growth and mature forest

* northern flicker (*Colaptes auratus*), Lewis' woodpecker (*Melanerpes lewis*), yellow-bellied sapsucker (*Sphyrapicus varius*), Williamson's sapsucker (*Sphyrapicus thyroideus*), red-naped sapsucker (*Sphyrapicus nuchalis*), hairy woodpecker (*Picoides villosus*), downy woodpecker (*Picoides pubescens*), white-headed woodpecker (*Picoides albolarvatus*), Northern three-toed woodpecker (*Picoides tridactylus*), black-backed woodpecker (*Picoides arcticus*), mountain chickadee (*Parus gambeli*), black-capped chickadee (*Parus atricapillus*), white-breasted nuthatch (*Sitta carolinensis*), red-breasted nuthatch (*Sitta Canadensis*), and pygmy nuthatch (*Sitta pygmaea*).

Management indicator species are addressed in separate sections of this inventory that relate to the habitat they are associated with. For example, pileated woodpecker and marten are covered in the old growth habitat section, and the primary cavity excavators are covered in the snag section.

1.7.2 Proposed, Endangered, Threatened, and R-6 Sensitive (PETS) Species

A Biological Evaluation/Biological Assessment that analyzes effects to PETS species (USDA FS 1991) will be done for projects that arise from this analysis. A pre-field review indicates that habitat exists for the following Region-6 sensitive species: Columbia spotted frog (*Rana luteiventris*) and spotted bat (*Euderma maculatum*). The gray flycatcher (*Empidonax wrightii*) likely does not exist in the Watershed. According to “Birds of Oregon: A General Reference” (Marshall and Hunter 2003) the gray flycatcher has not been documented in most of Union County and northern Baker Country. Only a couple “possible” sightings are recorded for the far northern edge of Union County. All available literature indicates that gray flycatchers’ primary habitat is dry sage and western juniper (*Juniperus occidentalis*), with sage and ponderosa pine (*Pinus ponderosa*) occasionally used. The southern edge of the Watershed contains minor amounts of sagebrush under ponderosa pine, but the area is not considered suitable for gray flycatchers based on the lack of sightings and marginality of habitat. No habitat for Canada lynx or bald eagle exists in the analysis area.

1.8 HUMAN USES

1.8.1 Current and Historic Uses

Vegetation in the watershed has been used for lumber, Christmas trees, livestock fences, firewood, mushrooms, huckleberries and agricultural products.

Native Americans have lived in and around the area for 8,000-10,000 years. The bulk of the population occupied the broad valley bottom lands just above spring flood level. From the existing archaeological evidence, there was minimal and light use of the lands within the Watershed.

While Euro-Americans were traveling through the area from the early 1800's, the first influx of major populations began in 1861/1862 with the discovery of gold forty miles south, near Sumpter. This was the start of the three major economic activities that formed the modern cultural landscape for northeastern Oregon: mining, lumbering/logging, and agriculture.

Local residents use the watershed year round, for a variety of recreational pursuits. The watershed provides through access to the Eagle Cap Wilderness from the Keating valley. The Powder River analysis area receives use throughout the year with the heaviest use period in the summer and fall. Huckleberry picking, firewood gathering, wildlife viewing, bow and rifle hunting, semi-primitive settings, dispersed camping and sightseeing are all evidence of the recreational value of this watershed.

1.8.2 Livestock Grazing

The entire watershed on NFS lands is utilized for summer range livestock grazing, exclusively with cattle. Livestock use has occurred within the watershed for over a century. There are nine active NFS grazing allotments utilized generally from June to October each year (see table XX). Most of the BLM and private lands within the watershed are utilized for livestock grazing also.

Table XX.

Allotment	Kind	Class	Stocking Level	Use Dates	Total Acres	Acres within WA
Big Creek	Cattle	Cow/Calf	539	06/1-10/15	43,457	28,632
Goose Creek	Cattle	Cow/Calf	498	06/01-10/30	29,642	18,205
Balm Creek	Cattle	Cow/Calf	130	07/1-07/30	1,769	1,769
Gilkison	Cattle	Cow/Calf	73	06/16-09/15	904	904
Hootin Rock	Cattle	Cow/Calf	13 ON/	06/16-09/15	1,616	1,616
Fruit Springs	Cattle	Cow/Calf	3 ON/	04/16-10/15	3,467	3,467
Clark Mountain	Cattle	Cow/Calf	7 ON/	07/01-10/31	1,616	540
Frazier Mountain	Cattle	Cow/Calf	30 ON/	06/01-10/30	6,721	2,054
Clover Creek	Cattle	Cow/Calf	1 ON/	06/01-10/30	686	686

1.8.3 Roads

The road densities in the subwatersheds in the analysis area range from **1.1 mi/mi^2 to 7.3 mi/mi^2** and for the entire analysis area is **3.3 mi/mi^2** (Table 5). The inventory of potential valley bottom roads within RHCA buffers in the analysis area resulted in approximately **233 miles** of existing roads (open, closed, FS and Non-FS).

Table 5 displays the existing miles of open and closed Forest Service (FS), non-FS roads and total road density within the watershed for NFS lands. There are approximately **340 miles** of inventoried road within the wateshed area in subwatersheds 13D, E & F and 29D, E, F, & H. Approximately **176 miles** of Forest Service roads are currently open to vehicle travel, and **95 miles** are closed. Approximately **200 miles** of existing roads are located within RHCAs in watershed, including approximately **100 miles** of open FS roads.

Table 5. Total existing lengths (miles) and densities (miles/square mile) of roads in the watershed.

Not sure if these numbers are correct

	Powder Keating/Powder Pondosa Watershed							
SWS/WA	Drainage Area (m^{i2})	FS Open Road (mi)	FS Closed Road (mi)	Total FS Roads (mi)	FS Road Density (mi/mi^2)	Total NON-FS Roads (mi)	Total FS & NON-FS Roads (mi)	SWS Road Density (mi/mi^2)
13B								
13C								
13D		4.7	3.8	8.5	3.3	13.2	23.6	1.3
13E		22.4	21.6	44.0	5.9	2.7	49.1	4.2
13F		65.6	30.2	95.8	4.2	0.0	97.2	4.1
13I								
13H								
29B								
29C								
29D		34.2	16.7	50.9	7.8	0.4	64.6	7.3
29E		32.2	15.7	47.9	5.4	9.5	59.2	3.0
29F		8.8	3.1	11.9	4.4	10.5	24.9	1.6
29H		7.8	4.2	12.0	4.8	7.1	21.8	1.1
13								
29								
Total								

1.8.3 Mining

The Powder River area has been an area of historic mining from the 1890's to the current time. Four areas in the watershed that have historic mining use are:
Pawnee Gulch, watershed 13-D and 13-F. This area is the site of numerous placer gold mining claims that exist today. Very little activity has taken place in the past five years but currently has 22 active claims. The area of activity is Township 6 South, Range 42 East, Sections 16, 17, 20.

Copper Butte, 29-F, Township 7 south, Range 42 east, section 23 on the south edge of the Wallowa-Whitman National Forest is an historic low grade Copper mine which was active in the early 1900's. Mine adits still exist today as well as remnants of the open pit where the smelter was located. There are no current active claims at this location.

The lower Balm Creek area, 29-E, Township 7 south, Range 43 east, section 32 east has historic mine adits that still exist today and are currently involved in CERCLA reclamation with the BLM. These mines are just south of the Forest Boundary and under the jurisdiction of the Bureau of Land Management. The names of these mines are the Poorman Mine and Balm Creek Shaft.

Goose Creek, 29-C which is actually administered by the Whitman Unit has active mine claims in the area which has been an area of historic gold mining of both Hard Rock adits and

placer mining sites scattered throughout the sub-watershed. Mine names and location are as follows:
Daddy Lode mine, Township 7 south, Range 43 east, section 23.
Sanger mine, Township 7 south, Range 43 east, Section 2.
Ledge Creek mine which is on private land surrounded by Forest Service, Township 7 south, Range 43 east, section 24.

1.8.4 History of the Analysis Area

Past Management Activities in the Watersheds

Activity	Time Period	Project Name and Location (5th Field HUC)	Description and Extent of Activity
Timber Harvest	1978 – 1985 > 20yrs Old	Langrell (13E) Tamarack Flats (13E) Tucker Creek (29H) UNK (13F) Upper Goslin (13F/29E) Waterpipe (29F)	These timber harvests projects are greater than 20 years old, treated 1,368 acres with a combination of thinning and regeneration prescriptions. These acres should be fully hydrologically and vegetatively recovered. Associated activities were road building and increased access as a result of these harvests.
	1986 – 1995 Pre INFISH & < 20yrs Old	Burn Creek (13E) Easy Oats Salvage (13F) Huckleberry DS (13C/F) Huckleberry LGRD (13C/F) Lost Goose (29D/E) Sawtooth Salvage (29H) Torch (29C/D) Velvet Creek (13F)	These timber harvests projects are less than 20 years old, but were implemented prior to INFISH standards for RHCA buffers. They treated 5,073 acres with a combination of thinning and regeneration prescriptions. These acres were all treated greater that 10 years ago and would be partially hydrologically and vegetatively recovered. Associated activities were road building and increased access as a result of these harvests.
	1996 – 2005 Post INFISH	Bald Angel CE (13E) Basin TS ((29D) Basin-Goose (29D) DS Eastside (29F/H) Gravel Flat (13D/F) Sawtooth Springs (29D/E/F/H) Sufferin Smith Salvage (13E)	These timber harvest projects were conducted based on all INFISH rangeland resources and noxious weeds protection and mitigation measures being implemented in full reducing the effects and speeding up the recovery rate. They treated 3,147 acres with a combination of thinning and regeneration prescriptions. Associated activities were road building and increased access but a reduction in road densities through decommissioning after project completion.
Livestock Grazing	1880s - Present	Balm Creek (29B/E) Big Creek (13E/D/F, 29D/E/F/H) Goose Creek (29C/D/E) Hootin Rock (29E/F) Fruit Springs (13D/E, 29H) Gilkison (29F/H) Upper Clover Creek (29F)	Unregulated grazing occurred prior to the early 1900s. After 1995 the listed allotments began regulating the grazing within the analysis area through INFISH. Associated activities and structures include fencing (boundary and riparian), cattle guards, water systems, drift fences, corrals, loading chutes and designated stock driveways.

Mining	1926 -1997 Claimed	40 claims (29D/E)	Of the 40 claims 22 are active mines sites. None have filed a Notice of Intent (NOI), or Plan of Operation (POO) for that area. The claims are regulated under the 1873 Mining Laws. Associated activities include monitoring status of activity and maintaining the database.
Irrigation Ditches	1800s – Present	Big Creek Ditch (13E/F) Trout Creek Ditch (13F) S. Catherine Ditch (13F) Jacob's Ditch (29D/E) Balm Creek Reservoir (29D) Phillips Ditch (29D)	Irrigation ditches are regulated by special use permits and maintenance and restoration are the responsibility of the water right holder(s). Associated activities include ditch maintenance and repair and diversion maintenance and upgrades.